CLAIMS

What is claimed is:

1.   A method of providing a wireless communication network with downlink

propagation channel information, the method comprising:

5   receiving a first signal at a wireless device transmitted from a network transmitter

through a downlink propagation channel;

determining a channel estimate for the downlink propagation channel at said

wireless device based on receiving said first signal;

transmitting said channel estimate from said wireless device to a network

10   receiver within the wireless communication network.

2.   The method of claim 1 wherein receiving a first signal at a wireless device

transmitted from a network transmitter through a downlink propagation channel

comprises receiving at least one transmit signal containing information known to the

15   wireless device.

3.   The method of claim 2 wherein determining a channel estimate for the downlink

propagation channel at the wireless device based on receiving the first signal comprises:

correlating the information known to the wireless device with the first signal; and

20   estimating channel characteristics of the downlink propagation channel based on

the results of said correlation.

4.   The method of claim 3 wherein transmitting the channel estimate from the

wireless device to a network receiver within the wireless communication network

25   comprises transmitting said channel characteristics back to said wireless communication

network.

5.   A method of generating a channel estimate for a downlink propagation channel in a wireless communication network, the method comprising:

transmitting a first signal from said network to a wireless device through the downlink propagation channel;

5   receiving a second signal at said network from the wireless device comprising channel estimate information derived from the first signal for the downlink propagation channel; and

setting a channel estimate in said network for the downlink propagation channel based on the channel estimate information.

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6.   The method of claim 5 further comprising updating said channel estimate in said network based on subsequent channel estimate information received from the wireless device.

15   7.   The method of claim 5 further comprising:

receiving channel estimate information from a plurality of wireless devices; and

setting a plurality of channel estimates in said network for downlink propagation channels corresponding to the plurality of wireless devices based on said channel estimate information.

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8.   A method of generating a channel estimate for a downlink propagation channel in a wireless communication network, the method comprising:

receiving a first signal at a wireless device transmitted from a network transmitter through one or more downlink propagation channels;

25   generating a loop-back signal at the wireless device comprising at least a portion of the first signal; and

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transmitting the loop-back signal from the wireless device to a network receiver

associated with the wireless communication network, wherein the first

signal is known by the network, such that the loop-back signal may be

used by the network to estimate the downlink propagation channel.

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9.   The method of claim 8 wherein generating a loop-back signal at the wireless

device comprising at least a portion of the first signal comprises adding at least a portion

of the first signal together with uplink information known to the network.

10   10.   The method of claim 9 wherein adding at least a portion of the first signal

together with uplink information known to the network comprises adding uplink pilot

information to the loop-back signal, such that the network can estimate uplink

propagation channel characteristics using said uplink pilot information.

15   11.   The method of claim 8 wherein generating a loop-back signal at the wireless

device comprising at least a portion of the first signal comprises:

looping back at least a portion of the first signal; and

interrupting loop-back of the first signal periodically to transmit uplink information

known to the network.

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12.   The method of claim 8 generating a loop-back signal at the wireless device

comprising at least a portion of the first signal comprises adding mobile-specific

information to the portion of the first signal looped back to form said loop-back signal.

25   13.   A method of generating a channel estimate for a downlink propagation channel in

a wireless communication network, the method comprising:

transmitting a first signal to a wireless device through the downlink

propagation channel;

receiving a loop-back signal from the wireless device at a network receiver

associated with the wireless communication network, said loop-back

5   signal comprising at least a portion of the first signal; and

generating a channel estimate for the downlink propagation channel based on

said loop-back signal from the wireless device.

14.   The method of claim 13 wherein generating a channel estimate for the downlink

10   propagation channel based on the loop-back signal from the wireless device comprises

correlating said loop-back signal with signal information used to generate said first

signal.

15.   The method of claim 13 further comprising removing uplink propagation channel

15   effects from said loop-back signal.

16.   The method of claim 15 further comprising generating said channel estimate for

the downlink propagation channel after removing said uplink propagation channel effects

from said loop-back signal.

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17.   The method of claim 15 wherein removing uplink propagation channel effects

from said loop-back signal comprises:

correlating said loop-back signal with known uplink information;

determining said uplink propagation channel effects based on said

25   correlation; and

canceling said uplink propagation channel effects from said loop-back signal.

18.   The method of claim 13 further comprising:

transmitting a plurality of first signals to a plurality of wireless devices;

receiving a plurality of loop-back signals from the plurality of wireless

5   devices; and

generating a plurality of channel estimates for downlink propagation channels

associated with the plurality of wireless devices based on said plurality of

loop-back signals.

10   19.   The method of claim 18 further comprising removing uplink propagation channel

effects from each one of said plurality of loop-back signals.

20.   The method of claim 19 further comprising generating said plurality of channel

estimates after removing said uplink propagation channel effects from said plurality of

15   loop-back signals.

21.   The method of claim 19 wherein each one of said loop-back signals includes

mobile-specific uplink information known to said network, and wherein removing uplink

propagation channel effects from each one of said plurality of loop-back signals

20   comprises correlating each one of said plurality of loop-back signals with the

corresponding mobile-specific uplink information.

22.   A method of providing a wireless communication network with downlink

propagation channel information, the method comprising:

        receiving first signals transmitted by the network as a composite received signal,

            said first signals combining at said wireless device to provide wanted

5   information to the wireless device while canceling unwanted information

            intended for other wireless devices;

        determining an amount of interference at said wireless device associated with the

            unwanted information arising from imperfect cancellation of the unwanted

            information; and

10   transmitting interference information back to the wireless communication

            network, wherein said interference information indicates network-based

            downlink channel estimation error to the network.

23.   The method of claim 22 wherein determining an amount of interference at said

15 wireless device associated with the unwanted information arising from imperfect

cancellation of the unwanted information comprises correlating said composite received

signal with known information embedded in said composite received signal.

24.   The method of claim 23 wherein said known information comprises mobile-

20 specific known information for each one of a plurality of wireless devices, including said

wireless device and said other wireless devices, and wherein correlating said composite

received signal with known information embedded in said composite received signal

comprises correlating said composite received signal with said mobile-specific known

information to determine an amount of interference caused by said unwanted information

25 signals for said other wireless devices.

25. The method of claim 22 wherein transmitting interference information back to the wireless communication network comprises transmitting an interference measurement of un-cancelled interference caused by the unwanted signals back to the network.

5   26. The method of claim 25 wherein transmitting an interference measurement of un-cancelled interference caused by the unwanted signals back to the network comprises transmitting interference measurements for each one of a plurality of unwanted signals corresponding to a plurality of other said wireless devices.

10   27. The method of claim 22 further comprising:

receiving a plurality of composite received signals at a plurality of wireless devices, wherein said composite received signal at each said wireless device comprises a wanted information signal for said wireless device and interfering unwanted information signals corresponding to other ones

15   of said plurality of wireless devices;

determining an amount of interference from said interfering unwanted information signals at each one of said plurality of wireless devices; and

transmitting interference information bearing on said amount of interference from each one of said plurality of wireless devices back to the network.

28.   A method of generating channel estimates for downlink propagation channels in

a wireless communication network, the method comprising:

transmitting first signals from network transmitters to a plurality of wireless

devices, such that said first signals combine at each said wireless device

5   to cancel unwanted information signals for other ones of said plurality of

wireless devices;

receiving unwanted signal interference measurements from said plurality of

wireless devices; and

updating said channel estimates of downlink propagation channels used by said

10   network in generating said first signals based on said unwanted signal

interference measurements, such that unwanted signal interference is

reduced at said plurality of wireless devices.

29.   The method of claim 28 wherein updating said channel estimates of downlink

15 propagation channels used by said network in generating said first signals based on said

unwanted signal interference measurements comprises:

determining an amount by which each of said channel estimates is in error based

on said unwanted signal interference measurements; and

adjusting said channel estimates based on said errors so as to reduce said

20   unwanted signal interference at said wireless devices.

30.   The method of claim 28 wherein transmitting first signals from network

transmitters to a plurality of wireless devices comprises:

generating an information signal for each one of said wireless devices;

25   combining said information signals using said channel estimates to generate said

first signals as weighted combinations of said information signals; and

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transmitting said first signals from a plurality of network transmitters, such that

each said wireless device receives a composite received signal as a

combination of said first signals.

5   31.   The method of claim 30 wherein the extent to which said unwanted signals

cancel at each one of said wireless devices depends on how well said channel estimates

match actual downlink propagation channel estimates between said network transmitters

and said wireless devices, and wherein updating said channel estimates of downlink

propagation channels used by said network in generating said first signals based on said

10   unwanted signal interference measurements comprises adjusting said channel estimates

such that said unwanted signal interference is reduced at said wireless devices.

32.   A mobile terminal comprising:

a receiver to generate a received information signal based on receiving a radio

15   signal from a remote transmitter in a wireless network;

a transmitter to generate a transmit signal for transmission to a remote receiver

in said wireless network based on processing a transmit

information signal;

a combiner to form said transmit information signal based at least in part on said

20   received information signal, such that said transmit signal from said

mobile terminal functions as a loop-back signal for said wireless network.

33.   The mobile terminal of claim 32 further comprising a processor to generate a pilot

information signal, and wherein said combiner generates said transmit information signal

25   at least in part based on combining said received information signal with said pilot

information signal, such that said loop-back signal to said wireless network carries pilot

information from said mobile terminal.

34.   The mobile terminal of claim 33 wherein said combiner generally operates to

5   form said transmit information signal based on said received information signal, but

periodically operates to form said transmit information signal based on said pilot

information signal, such that said loop-back signal to said wireless network comprises

looped-back transmit information from said wireless network, interspersed with pilot

information from said mobile terminal.

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35.   The mobile terminal of claim 33 wherein said processor generates said pilot

information, such that said pilot information signal distinguishes said mobile terminal with

said wireless network, thereby allowing said wireless network to determine said mobile

terminal as the source of said loop-back signal.